PSO-based robust H∞ controller design using cascade compensation network

ABSTRACT

This paper proposes a method for robust controller design using cascade compensation network. The method uses particle swarm optimization (PSO) to tune the controller and performance weighting function parameters by minimizing a cost function subject to H∞-norm specifications. Levy's curve fitting method is used to accurately express the multiplicative uncertainty function. The proposed method is applied to pneumatic servo actuator with system uncertainty and wide range of load variations as an example to illustrate the design procedure of the proposed controller. It is shown that the proposed controller presents robustness over a wide range of parameters change. A comparison with conventional H∞ controller is presented.

Keyword: Cascade compensation network; Robust control; Uncertain systems; Pneumatic actuator; Lag-lead controller; PID controller; H∞ control; PSO